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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/722,400	11/27/2000	Tianhong Zhang	MIC-58DV2	5784

7590 11/12/2004

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EXAMINER	
MOHAMEDULLA, SALEHA R	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 11/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/722,400	ZHANG ET AL.	
	Examiner	Art Unit	
	Saleha R. Mohamedulla	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-12,27,29-40 and 42-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-12,27,29-40 and 42-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 9-12, 27, 29-40 and 42-50 are pending.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 34, 38 and 46 are rejected under 35 U.S.C. 102(e) as being anticipated by US# 5,922,623 to Tsutsui et al.

Tsutsui teaches a selective vapor phase etching method. The method is characterized by comprising a step using a gas containing vapor of hydrogen fluoride to remove a silicon oxide film disposed on a semiconductor substrate having an electrode made of a high melting point metal silicide (col. 2, lines 60-67).

Tsutsui teaches subsequently depositing a buffer layer 2, channel layer 3, cap layer 5 and a silicon oxide layer 6 on a substrate (col. 4, lines 50-65). Part of the silicon oxide layer is removed, and a Schottky metal WSi and gold film 8 are deposited (col. 5, lines 5-10). Next, the silicon oxide film 6 is vapor phase-etched by gases including a vapor of hydrogen fluoride (HF), and the silicon oxide film 6 is removed as shown in Fig. 1C (col. 5, lines 14-18). Therefore, Tsutsui teaches that the WSi and Gold layers are resistant to vapor hydrogen fluoride etching as they are not etched in Fig. 1C. The WSi and Gold layers form a mask as they expose

material under the layers. The openings in the WSi and Gold layers surround the WSi/Au structure. That is, the openings exist to the left and right of the WSi/Au structure. The silicon oxide layer, under the WSi and Gold films, is able to be etched and is actually etched by vapor hydrogen fluoride. Therefore, Tsutsui teaches claim 27, 32, 34, 40 and 46 limitations. Claim 31, 38 and 44 are also rejected as the limitations are drawn to the method of making the mask and not to the structural features of the mask itself. Also, new claim limitations drawn to the patterned polyimide being removable after etching is drawn to a method of making or using the mask and does not limit the structural features of the mask itself. Also, the WSi and gold structure can be removable after etching. They can be removed by hand or by an aggressive acid solution. It is inherent that they are removable.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 39 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 5,922,623 to Tsutsui et al.

Tsutsui teaches the limitations discussed above in paragraph 2. Tsutsui does not teach that the opening has dimensions less than one micron. However, it would be obvious to one of ordinary skill in the art to form the opening to be less than one micron in order to form gates and other integrated circuit features having a design size less than one micron.

5. Claims 9, 11, 27, 29, 31-33, 35, 36, 40, 42, 44, 45, 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 5,922,623 to Tsutsui et al. in view of US# 5,286,679 to Farnworth et al.

Tsutsui teaches or suggests the limitations discussed above in paragraphs 2 and 4. Tsutsui teaches that the mask comprises a patterned photoresist that is used to pattern the tungsten layer (col. 2, lines 10-25). Tsutsui does not specifically teach that the photoresist comprises polyimide. Farnworth teaches patterning wafer layers using a photosensitive material. The photosensitive material is exposed through a suitable mask or reticle and chemically etched in the desired pattern. Farnworth teaches suitable photosensitive materials include polyimides (col. 6, lines 50-60).

The references are analogous art as they are drawn to patterning semiconductor layers using photosensitive and etching processes. It would be obvious to one of ordinary skill in the art to use a polyimide as Farnworth teaches polyimides are commonly used in the art as photosensitive materials that pattern underlying layers on wafers.

6. Claims 9, 10, 12, 27, 30-33, 35, 37, 40, 43-45, 47 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui et al. in view of US# 5,653,619 to Cloud et al.

Tsutsui teaches the limitations discussed above in paragraphs 2 and 4. Tsutsui does not teach that the mask comprises non-photosensitive polyimide. Cloud teaches the use of polyimide in an integrated circuit structure. Cloud teaches a suitable buffering material includes a thin layer of polyimide. It would be obvious to one of ordinary skill in the art to use Dupont PI-1111

as the material is a well-known polyimide. The nitride buffer layer 21 has the effect of enhancing the strength of the tip 13, which is one advantage of performing this optional step. The buffering layer 21 substantially impedes the etching progress into the layer on which the buffering material 21 is deposited (col. 6, lines 40-50).

The references are analogous art as they are drawn to forming gate structures for semiconductor devices. It would be obvious to one of ordinary skill in the art to use a non-photosensitive polyimide as Cloud teaches that the polyimide enhances the structure of the underlying material and prevents undesired etching of lower lying portions (col. 6, lines 35-40).

Response to Arguments

7. Applicant argues that the WSi and gold layers are not used as a mask in Tsutsui because they are not removable after etching. However, this mask definition is not found in the original disclosure. The claims do not define "mask" in this manner. These layers are reasonably interpreted as a "mask" because they are not etched while underlying layers are etched and because they cover or mask underlying layers. In addition, the limitation "removable after etching" does not materially limit the mask product claims themselves. Also, the WSi and gold structure can be removable after etching. They can be removed by hand or by an aggressive acid solution. Applicant argues that the WSi and gold layers are not used as a mask in Tsutsui because they do not enable selective etching and are part of the final structure. However, these mask definitions are not found in the original disclosure. The claims do not define "mask" as

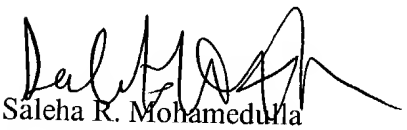
stated in the Amendment. These layers are reasonably interpreted as a "mask" because they are not etched while underlying layers are etched and because they cover or mask underlying layers. Applicant also argues, with respect to claims 34 and 46, that the WSi and gold layers do not have openings, however, to the left and right of the WSi and gold structure, there are openings that expose the underlying silicon oxide layer that is etched by vapor HF. The WSi and gold structure are resistant to vapor hydrogen fluoride etching. Because these openings expose the underlying silicon oxide layer, they extend through the WSi and gold layers. Therefore, Tsutsui teaches the new limitations. Applicant argues that Tsutsui does not teach a vapor HF etchant, however, vapor etching using gases including HF is taught in column 5, lines 14-18. Applicant argues that Tsutsui and Farnworth are not combinable because Farnsworth is directed to attaching semiconductor die to an adhesive layer. However, Farnworth teaches a general step of patterning a polyimide photosensitive layer on a semiconductor wafer through a mask or reticle. Farnworth was relied upon to show that patterning polyimide photoresist coated semiconductor wafers is common in the art. Applicant argues that Cloud does not teach desirability of using the disclosed polyimide. However, Cloud teaches that the polyimide enhances the structure of the underlying material and prevents undesired etching of lower lying portions. Therefore, Applicant's arguments are not persuasive.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Saleha Mohamedulla whose telephone number is (571) 272-1387. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Saleha R. Mohamedulla
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November 10, 2004